

2016

Make it so: Employing a multi-player starship bridge simulator in a military-based leadership course

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Green, Robert, "Make it so: Employing a multi-player starship bridge simulator in a military-based leadership course" (2016).
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The *Make It So* Leadership Training Program employs the multiplayer PC-based Artemis Spaceship Bridge Simulator game as the capstone exercise in a thirty-hour leadership program. I sought to replicate the leadership training I received as a seagoing military officer, in order to provide students with a valuable and memorable leadership experience in a novel setting. Guided by the Understanding by Design® (UbD) (Wiggins & McTighe, 2005) framework, I designed this course to develop students' transfer and understanding capacities in leadership principles. I received feedback and guidance from alpha and beta testers throughout the design and development phase. As a work in progress, this leadership program will be offered as an innovative continuing education experience and as a professional development option for regional businesses and other organizations.

Make It So: Employing a Multi-Player Starship Bridge Simulator
in a Military-Based Leadership Course

A Graduate Project Report

Submitted to the

Division of Instructional Technology

Department of Curriculum and Instruction

In Partial Fulfillment

Of the Requirements for the Degree

Master of Arts

UNIVERSITY OF NORTHERN IOWA

by

Robert Green

May 2016

This Project Report by: Robert Green

Titled: *Make It So*: Employing a Multi-Player Starship Bridge Simulator in a Military-Based Leadership Course

has been approved as meeting the research requirement for the Degree of Master of Arts.

Date Approved

Graduate Faculty Reader

Date Approved

Graduate Faculty Reader

Date Approved

Head, Department of Curriculum and Instruction

Abstract

The *Make It So* Leadership Training Program employs the multiplayer PC-based Artemis Spaceship Bridge Simulator game as the capstone exercise in a thirty-hour leadership program. I sought to replicate the leadership training I received as a seagoing military officer, in order to provide students with a valuable and memorable leadership experience in a novel setting. Guided by the Understanding by Design® (UbD) (Wiggins & McTighe, 2005) framework, I designed this course to develop students' transfer and understanding capacities in leadership principles. I received feedback and guidance from alpha and beta testers throughout the design and development phase. As a work in progress, this leadership program will be offered as an innovative continuing education experience and as a professional development option for regional businesses and other organizations.

Keywords: leadership, military, organizational development, simulators, teamwork, training

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*Make It So: Employing an Adaptive Multi-Player Starship Bridge Simulator
in a Military Leadership Training Course*

This leadership training course is designed to provide a novel professional development opportunity (through a starship bridge simulation) for new and emerging leaders who desire a greater level of self-awareness in their leadership and teamwork roles. Ideally delivered as continuing education in the community college setting, or as a seminar in a corporate facility, the leadership course will infuse core lessons of tactical and strategic military leadership into civilian managers and leaders. The full program of instruction guides participants toward an enduring understanding of effective self-leadership, then team leadership, and finally organizational leadership.

The initiation of this program was based on a local needs analysis. Locally, a quick overview of community college and continuing education catalogs showed that this kind of team-based practical leadership training does not currently exist for the general public in our region, though some large organizations like John Deere, Rockwell-Collins, and Target offer in-house leadership training (albeit without the practical simulation game component). This course sought to fill this gap by applying the instructors' unique military leadership experience to this important field of study. Secondly, this program was also developed after analyzing national online training programs, which were determined to lack a critical 'in-person' component that cannot easily be replicated through online instruction.

Because the time allotted for my course would be far less than the extensive period devoted to leadership training by the military (in some cases several months), this program would focus on core followership and leadership concepts, and as a capstone exercise, would include a simulation component to allow students to demonstrate their new learnings for greater

understanding and assessment.

In this program of instruction, I sought to match the quality and impact of similar leadership instruction I received as a commissioned officer in the United States Coast Guard, via the U.S. Coast Guard Academy's Shipboard Control and Navigation System (SCANTS) in New London, Connecticut. SCANTS, a realistic simulation of a Coast Guard patrol ship's bridge, was a capstone exercise at the end of Nautical Science and Leadership courses through four years as a cadet at the Academy, as well as during the two-week Prospective Commanding Officer and Executive Officer PCO/PXO school. The simulator experience (teaching practical leadership, communication, and team coordination skills) had a long-lasting positive impact on my own professional life, which I was eager to replicate for a civilian audience for own growth as leaders.

While leadership courses exist online, and expensive on-site training programs are available in larger cities, the Cedar Valley (Waterloo, Cedar Falls, Hudson, and Waverly, Iowa) does not have a single, consistent training venue for coaching new leaders in their roles. This program seeks to address this gap by creating such a course, which is intended to provide a seminar format for new leaders to develop strong networks of fellow leaders and grow in their awareness of leadership principles. To this end, I will apply the extensive body of simulator-based training research to a civilian context, using commercial-off-the-shelf (COTS) technology to impress critical military leadership concepts on student practitioners through a simulation experience.

The leadership training component of this project also takes its cues from the United States Coast Guard (USCG), in the form of their fleet-wide leadership training framework – 28 identified leadership competencies grouped into four quadrants (Leading Self, Leading Others, Leading the Coast Guard, and Leading Performance and Change) (U.S. Coast Guard, n.d.). My

instructional colleague (Commander Jeffrey Dow) and I are both former Coast Guard officers with a combined thirty years of officer leadership and teamwork experience, and successfully employed these 28 leadership competencies in our own careers. This background gives us confidence that we can adapt the critical lessons from our officer training program to a civilian context, and configure a commercial teamwork simulation game to serve the needs of our leadership course participants. This project's success may inspire other similar efforts elsewhere, due to the affordability of the technology, the value of the leadership and teamwork training experience for a broad spectrum of student types, and the reproducibility of comprehensive leadership training in a variety of professional and academic settings.

This project references a variety of specialized terms. While the literature review turned up various – and sometimes competing – definitions of simulations, video games, serious games, and simulation games, for this project I will use the more generic term ‘simulation game’, with a working definition as instruction delivered via computer which “immerses trainees in a decision-making exercise in an artificial environment in order to learn the consequences of their actions” (Marlow, Salas, Landon, & Presnell, 2015, p. 415). Leadership for this course is defined as “the process of influencing the activities of an individual or group to achieve certain objectives in a given situation” (Siewiorek, Gegenfurtner, Lainema, Saarinen, & Lehtinen, 2011, p. 1014). An excellent working distinction between leadership (which this program covers) and management (which it does not address) is that management is about coping with *complexity*, while leadership is about coping with *change* (Taylor & Rosenbach, 1992). Management topics such as prioritization, effective delegation, budgeting, and personnel evaluation are important, but outside the scope of our training; inclusion would distract from the core focus of the *Make It So* program, which is about understanding, instituting, and adapting to change (in self, in teams, and

in organizations).

This program of instruction relies heavily on *adaptability*: here defined as the ability of a simulation game to change in difficulty in response to player behavior, to optimize interest and challenge (Lopes & Bidarra, 2011). For the purposes of this project, the term ‘participants’ refers to the recipients of course instruction in the classroom and simulator. The simulation director is the person responsible for organizing and programming the simulator experience (referred to in the Artemis instruction manual as the ‘gamemaster’). Finally, the terms for the various components of this project are worth delineating:

- *Module*: One single unit of instruction, intended for delivery within a one-hour block of time. Each module is self-contained; slides, worksheets and lecture notes have been produced for delivery, potentially independent of the other modules.
- *Session*: Each course is optimized for delivery in three days, with each day consisting of three hours of instruction or simulation. For this reason, a session the optimized ‘daily’ grouping of modules for administration and coordination, (including times for planned breaks and other support periods).
- *Course*: Three separate aspects of leadership are covered in this project: *Self Leadership*, *Team Leadership*, and *Organizational Leadership*. Each of these topics is a course, made up of three sessions each.
- *Program*: The entire project - all three courses totaling thirty hours of classroom and outside work - makes up the Self-Team-Org Leadership Program.

Literature Review

Research for this project focused primarily on simulation games and similar technologies in training – particularly leadership and team training. The review first sought to clarify the roles and uses of simulation games in instruction, and successes and failures in each case.

Commonalities of successful simulation and serious game-based training were explored, with focus placed on the most critical aspects of the experience. The role of post-game debriefing was then explored, as the literature pointed to this activity as a critical component of successful simulation.

The literature review gave strong indication that a simulation game could be a very effective component of leadership instruction. Siewiorek, et al. (2011) observed, “many educators consider games and simulations as useful tools in teaching topics and skills that have proved to be difficult to deal with in traditional educational situations” (p. 1012). However, researchers also warned against simply adopting a simulation exercise as a novelty or a draw for the course. For example, Salas, Bowers and Rhodenizer (1998) warned that careful consideration was required to determine training needs and instruction features first, and then then only then assessing the added value of a simulation experience to meet those needs.

The literature review also revealed significant guidance on the traits inherent in effective simulation gaming. These were:

- *Fantasy* – The ability of the experience to represent something distinct from real life, which evokes non-existent images (Garris, Ahlers, & Driskell, 2012; Wilson, et al., 2009);
- *Representation* – the precision of replication, physically and psychologically, of the environment described by the virtual experience (Wilson et al., 2009);

- *Sensory Stimuli* – The ability of the experience to tap into the users’ senses via “visual, auditory, or tactile simulations with the purpose of distorting perception and using a temporary acceptance of an alternate reality” (Garris et al., 2012; p. 449);
- *Challenge* – An optimal amount of difficulty, matching the user’s ability, in the effort to accomplish the goals of the scenario (Garris et al., 2012; Lopes 2011; Wilson et al., 2009);
- *Mystery* – Consisting of sensory curiosity (engaging in novel experiences) and cognitive curiosity (reconciling paradoxical or incomplete information); mystery seeks to engage the participant in resolving the unknown (Garris et al., 2012; Wilson et al., 2009);
- *Assessment* – The mechanism employed to measure achievement through targeted feedback, whether explicit (scorecards and rankings) or implicit (goal completion, character injury or death); it can also be termed feedback (Marlow et al., 2015; Wilson et al., 2009);
- *Control* – The level of influence exercised by the participant on the virtual environment and the instruments of goal achievement. (Garris et al., 2012; Marlow et al., 2015; Wilson et al., 2009).

Because my proposed simulation experience is a starship bridge rather than a Coast Guard cutter’s bridge, I am particularly interested in the element of *fantasy* and the possibility of teaching real world leadership concepts using fantasy-world simulation. The literature suggested that a fantasy setting such as a science-fiction universe can be quite effective as an environment for real-world learning, due to the entertainment and engagement value inherent in a fantasy experience (Crookall, 2010; Sitzmann, 2011; Wilson et al., 2009).

Choosing an appropriate tool requires workable definitions and an understanding of the characteristics of successful technology-based training. Again the literature has been instructive. Simulations, video games and serious games are all technological means to build learning

environments, and all share similar technical features; however, they exhibit distinct characteristics and purposes. Researchers generally agree that simulators seek to replicate a real-world experience as closely as possible, whereas serious games and video games instill fantasy and mystery into the experience, for the sake of engagement and entertainment (Crookall, 2010; Girard et al., 2012; Sitzmann, 2011; Lopes & Bidarra, 2011). The research also showed that the field of simulation-based learning is greatly expanding. In the past several decades, computer graphics, processing, and networking capabilities have increased dramatically, allowing human performance researchers in academic, corporate, and military settings to invest significant effort and funds on multi-player simulation games for training (Crookall, 2010; Raybourn, 2007).

A successful classroom and simulation experience would benefit from an understanding of the dynamics and pedagogy of simulator learning. Landers and Callan (2011) explored the psychological implications of gamification in employee training, defining and investigating facets of four learning needs (knowledge, observable skills, problem solving skills, and attitudes). Sitzmann (2011) similarly grouped simulation-based learning patterns into four distinct affective (motivation, trainee reactions, and self-efficacy), behavioral (effort), cognitive (declarative knowledge and retention), and skill-based (procedural knowledge and retention) categories. Both studies provided a framework for identifying and categorizing the core learnings to be targeted for exploration and assessment through the simulator experience. Sitzmann (2011) also took care to caution that, “simulation games may be an ineffective stand-alone training tool because people do not naturally learn complex relationships from experience alone” (p. 515).

In the literature review’s discussion of learning needs, several studies highlighted the importance of a facilitated post-exercise discussion (debrief) to allow for reflection and exploration of the learnings gleaned from the scenarios (Beaubien & Baker, 2004; Crookall,

2010; Girard, Ecalle, & Magnan, 2012; Siewiorek et al., 2013). Fanning and Gaba (2007) provided a detailed, critical examination of debriefing in simulation-based learning in the previous decade, including the process for debriefing, models and objectives, and the role of the facilitator in the effort. Their research concluded that “debriefing is the ‘heart and soul’ of the simulation experience” (p. 124), and that newly emerging techniques, methods, and assessment of debriefing were encouraging (Fanning & Gaba, 2007). Sitzmann (2011) noted, “After one or more gaming cycles, trainees should participate in a debriefing session in which the simulation game as well as its applicability to the real world is discussed” (p. 493). Finally, Siewiorek et al. (2013) obliquely referenced the importance of debriefing, concluding that, “more in-depth discussion should be conducted in order for the leaders and participants to realize why it was not possible to use the leadership styles that they wanted to use at the beginning of the gaming session” (p. 1029). In each of these studies, instructor-facilitated transferability was paramount – connecting the dots between simulation and reality.

In summary, the review of the literature showed agreement that these simulation game experiences had merit for additional research and use for training, and filled an important niche in immersive, experience-based learning (Crookall, 2010; Girard, Ecalle, & Magnan, 2012; Marlow et al., 2015; Siewiorek et al., 2013). Siewiorek (2013) concluded, “It can be stated that the training increased participants’ consciousness about the features of leadership and provided them with an experience they were able to reflect” (p. 1029). Given the positive reactions to fantasy-based efforts in increasing engagement and interest, a simulation game which incorporates science-fiction elements appeared to be a novel and useful way to ingrain leadership concepts in students.

Description

This project consists of the design of a comprehensive leadership course for new and aspiring leaders at the college and continuing education level. Within a projected thirty-hour delivery window, my colleague and I determined to split our leadership instruction into three separate ten-hour courses, entitled *Self Leadership*, *Team Leadership*, and *Organizational Leadership*. This approach allows great flexibility in presentation, as we can tailor the instruction to meet a variety of participant needs (from simple *Self Leadership* concepts to much more complex *Organizational Leadership* topics). Our baseline schedule (from which we would deviate as necessary) would consist of three hours of instruction per day, with one additional hour of outside reading and activity, for a total of ten hours in the course. The first two days (sessions) would be classroom exercises and discussion, and the final three hours would be a capstone simulator exercise and debrief which would allow students to practice and demonstrate their new knowledge and skills.

The preparation of the course began in January 2016. My colleague, a former Commander in the Coast Guard with substantial leadership training and experience, served as the primary subject matter expert for the course. I carried out the instructional design activities, using UbD to identify goals, build understandings, and prepare an appropriate lesson plan. UbD was a key focus in a previous graduate course, and appeared to be an ideal framework for course preparation, as we could list the kinds of understandings needed to be a successful leader, and then walk backward to prepare instruction that would allow students to eventually earn these understandings.

Due to a miscommunication with Hawkeye Community College, the leadership course was actually advertised for February 2016, far earlier than our expectations. As a result,

Commander Dow and I devoted significant time to course preparation during January and February. We chose the Team Leadership course for preparation first, as this was the subject matter identified in Hawkeye's course catalog. Fortunately, Commander Dow had already designed a significant amount of the course material, which he had used for teaching past leadership courses; this posed an interesting problem – the risk of building the course *around* the available material, rather than fitting material to meet overarching goals, big ideas, and enduring understandings. To address this concern, I deliberately chose to ignore the available material until after we'd defined these major aspects of the course in Stage I (Desired Results), and Stage II (Evidence). This approach allowed us to then pick and choose from the available material for our Stage III (Lesson Plans); in the end, we were still able to incorporate nearly all of his original lesson material, while still conforming to UbD principles.

For the simulator experience, I determined that a commercially-available simulation game would likely be superior to anything I could custom build myself. Indeed, “the games industry budget is now greater than that of TV...and video games generate more revenue than the Hollywood film industry” (Crookall, 2010, p. 901), giving me confidence that existing games would have the success traits I had identified in the literature review. Indeed, the wide array of simulation games available (and the amount of time and money being spent to produce them), allowed me to easily choose from low-cost, commercially available systems rather than build my own simulator.

Although I had previous experience with the Artemis Starship Bridge Simulator, I sought to remain objective and allow the literature review to guide the final decision for tool selection; I need to avoid letting the tool define the lesson plan as described by Wiggins and Tighe (2005). Fortunately, the seven tenets of successful simulation discussed in the review (fantasy,

representation, sensory stimuli, challenge, mystery, assessment, and control) were ably represented in Artemis, and appeared promising for providing the necessary environment for learnings on leadership. Moreover, because our leaders would likely come from diverse backgrounds (education, healthcare, manufacturing, etc.), the deployment of a pop-culture based science fiction starship bridge simulator actually provided a fairly ‘neutral’ learning environment, as it would not favor one industry or profession over another in our exercise.

Admittedly, even *suggesting* the use of a simulator/game as a key aspect of a course risked violating a basic tenant of technology use in the classroom; Both Tighe and Wiggins (2005) and Landers and Callan (2011) warn against selecting the tool before prior to finalizing the objectives. “Decisions about course objectives must be made definitively, and only then can decisions about specific methods be made. Otherwise, learner time is wasted and costs rise unnecessarily” (Landers & Cullan, 2011, p. 401). Mitigating this risk is my personal experience and resulting confidence of having participated in very similar shipboard simulations as a U.S. Coast Guard officer, with equivalent technologies and learning dynamics employed to great effect for leadership development.

After completing preparations for the Team Leadership course in mid-February 2016, we recruited an experienced local leadership trainer as our initial alpha tester. We walked her through each of the components of our course in detail, explaining exactly what would be discussed, how the students would interact, the understandings that we sought in each component, and the time allotted for each exercise. By carefully describing the nine-hour course and hour of outside work, we enabled our initial tester to provide invaluable feedback for pacing, sequencing, and content. This review also aided us greatly in our preparation of the remaining two courses (*Self Leadership* and *Organizational Leadership*), as the alpha tester’s insights

applied to both of those courses as well. After this alpha session, my colleague and I immediately incorporated the feedback into the Team Leadership course, and finalized our handouts and other preparatory materials for delivery.

Commander Dow and I were able to carry out a second alpha evaluation in early April, through a six-hour open house of the Artemis Bridge Simulator technology at Rod Library (at the University of Northern Iowa). During multiple demonstration sessions throughout the day, we:

- Explained the rationale for creating the program;
- Showed how the starship bridge simulator related to leadership and followership;
- Walked through the course slides and discussion topics;
- Solicited public input on the program and how we might best use it to best meet the training needs of the attendees;
- Linked three linked starship bridges and allowed teams to explore the mission scenarios and work with (or against) the other teams for mission success.

Over 70 attendees (ranging from school-age children to professors and business leaders) showed strong enthusiasm for the experience, and many expressed interest in attending the course once offered through a college continuing education program. No additional topics or discussion areas were proposed, and all simulator participants responded that the experience was engaging, enjoyable, and useful for practicing leadership and teamwork concepts. The open house was an excellent demonstration because we witnessed participants becoming completely engrossed in the immersive experience for hours at a stretch, working successfully as teams. Our leadership coaching (especially communication and information management) provided immediate benefit to the bridge team abilities, showing that our training can have an impact on performance.

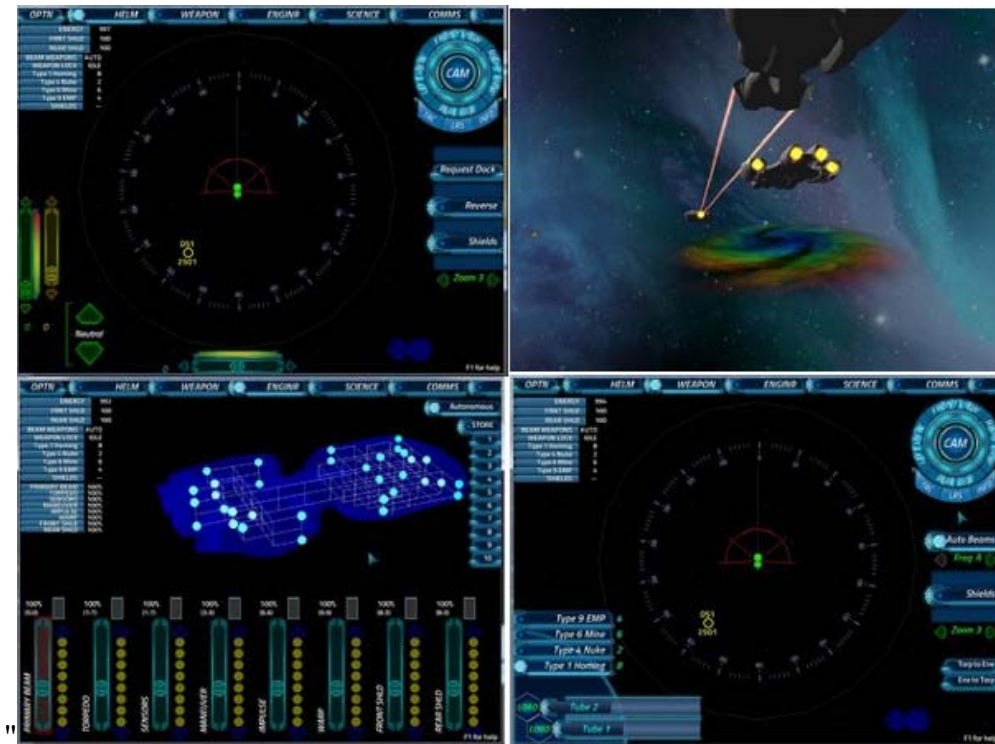


Figure 1: Artemis Control Station Screenshots. Retrieved February 24, 2016 from

<https://www.library.uni.edu/rodcast/201504/try-out-our-artemis-spaceship-bridge-simulator>

As we tweaked the simulator experience during the open house, we discovered that Artemis Starship Bridge Simulator provided significant customizability to meet our training objectives. These included general difficulty settings, varying numbers of enemy ships and encounters, and changing station configurations based the number of available participants (from three to six per bridge). The system, comprised of six separate PC's (five client machines and one server machine), allowed five people to work together in a simulated starship bridge. The server machine projected the simulated 'main screen' onto a large display (such as an overhead projector), and the remaining five stations (weapons, helm, communications, science, and engineering) were controlled by participants working together. Overseeing each crew was a

designated Captain who coordinated the efforts of the bridge team in order to accomplish assigned missions.

The Artemis Starship Bridge Simulator is designed to require close coordination and communication between the stations; the communications officer may have critical information required by the weapons officer, and the engineer might have to tweak the engines to meet the requirements of the helmsman. This dynamic enables communication and delegation to be practiced among team-mates and their leader, in a high-pressure setting. We saw this leadership and teamwork dynamic at work constantly in our open-house session, giving Commander Dow and me ample observation time to discuss refinement of the preparatory lessons for bridge performance, which could then be transferred to their ‘daily life’ as leaders in their organizations.

The literature review described an optimal challenge component (Garris et al., 2012; Lopes, 2011; Wilson et al., 2009). In our alpha testing, this was achieved by careful selection of the mission scenarios to be used in the thirty minute exercises. The program contains a variety of pre-built missions with varying degrees of completion difficulty. My colleague and I chose to load three mission scenarios during the final day of training, with increasing levels of difficulty. This approach would allow the bridge team to normalize their activities and working relationships during the first run, then rotate and build upon their previous knowledge in a harder scenario, and then finally perform more confidently in the last difficult scenario. We decided that the goal was not necessarily to complete all mission objectives, but instead to carry out proper leadership techniques no matter how well or poorly their ship was performing.

Sensory stimuli was also an important consideration for the simulator exercise. Our initial classroom assignments at Hawkeye Community College required us to use the same room for the course instruction and the simulation game. As I wished to instill as much a sense of ‘otherness’

as possible to the simulator experience, I obtained permission to use a different lab entirely for running the Artemis bridge. We then adjusted our lesson plan to use only that lab for the final day (i.e. no classroom instruction), so that students would begin their day right on the bridge of ARTEMIS, complete with dimmed lights, background ambient sounds and consoles arranged as much as possible like a starship bridge. This will hopefully increase the immersion level of the simulation, allowing students to put on their ‘game faces’ and be ready for the challenges they will face as the crew of the fictional ARTEMIS starship.

Finally, to alleviate concerns that the bridge crew would be overwhelmed by all of the controls in each station, my colleague and I decided to designate crew positions for the first mission, and allow the students to self-designate for the final two missions. We believe that this approach will give the students a greater sense of control of the mission outcome at the start of the day, as well as allow them to team-teach the stations to each other during later missions – adding (hopefully) to the sense of teamwork and belonging. At the end of the second day’s session, we provided our students with dossiers assigning them to the various stations, along with basic console instructions and a link to an official Artemis YouTube channel demonstrating the operation of their station. This approach gave students the opportunity to prepare themselves as much or as little as desired for the bridge simulator experience – a basis for important additional lessons in followership (in particular, maintaining technical competency).

Outcomes

The complexity of this project (and short timeframe for implementation and reporting) led my colleague and me to refrain from actively marketing the Hawkeye Community College 'Active Leadership' class in early February 2016. We believed that more time was needed to fully develop the framework and lesson plans for the applicable course, *Team Leadership*;

fortuitously, the 'Active Leadership' solicitation did not generate the minimum number of participants required by Hawkeye Community College, so the February course was cancelled. This cancellation was not publicized, so our reputation and perceived value of the course remained intact. This reprieve gave us the opportunity to continue refining the entire course of instruction – not just the ten-hour Team Leadership course, but also the additional ten-hour *Self Leadership* and *Organizational Leadership* courses. The importance of this time extension quickly became evident as my colleague and I discovered five critical threads of similarity between all three projects (Command, Control, Contribution, and Completion, bound together by Communication). These touchstones became recurring facets of all three courses, allowing for a more holistic view of leadership; we were fortunate to uncover them prior to our formal lesson planning.

Course Preparation

We sought to begin with end in mind, as instructed by Understanding by Design (Wiggins & McTighe, 2011) in our course preparation efforts; paradoxically, the preparation was easiest in the two courses that my colleague and I had never formally taught (*Self Leadership* and *Organizational Leadership*). I had previously built a UbD framework course in my graduate studies, so was comfortable with working in this process. Plus, my background and interest in leadership studies and the Coast Guard Leadership Competencies (n.d.) framework provided me with a workable group of goals for attainment in each of the courses. The existing framework from a respected Federal agency provided legitimacy to the lessons being offered, enabling me to focus less on *what* should be offered, but instead how to assist the learners in generating the enduring understandings which would make the courses worthwhile (Wiggins & McTighe, 2005). The *Organizational Leadership* course, in particular, provided the opportunity to delve

deep into strategic planning, and to develop many original training aids which I had not originally expected to create for the course. Several of these, including a standard terminology for strategic planning, have since been adopted by my employer (Rod Library at the University of Northern Iowa), showing that these aids and techniques do have practical value.

Challenges Faced

The most difficult aspect of this project was preparing the Organizational Leadership course, and a corresponding starship simulation construct for demonstrating Organizational Leadership principles. I am already well-versed and experienced in leadership of self and leadership of teams, and my colleague has taught both topics extensively. In contrast, neither of us has taught the principles of organizational leadership (although I directly experienced it for seven years as the head of my own company). So, after a ‘crash learning’ effort to become more familiar with formal strategic thinking, entrepreneurship, partnering, and organizational development, our ten-hour Organizational Leadership course offers valuable avenues for discussion and understanding which wouldn’t be readily accessible outside of a course like this. Still, it needs much refinement. Improvements will require the input and feedback of an experienced organizational leader – one with a background in the concepts described in the Organizational Leadership course (strategic planning, organizational development, entrepreneurship, and partnering). This will be outside the scope of the current project, but is planned for a later phase of the leadership program’s development.

The second greatest challenge was assembling prospective students for the entire thirty-hour course. This is a very significant time commitment for working professionals, and simply wasn’t an option in the timeframe allowed. The commitment was potentially mitigated by breaking the course up into three separate, independent sessions; even so, lacking testimonials

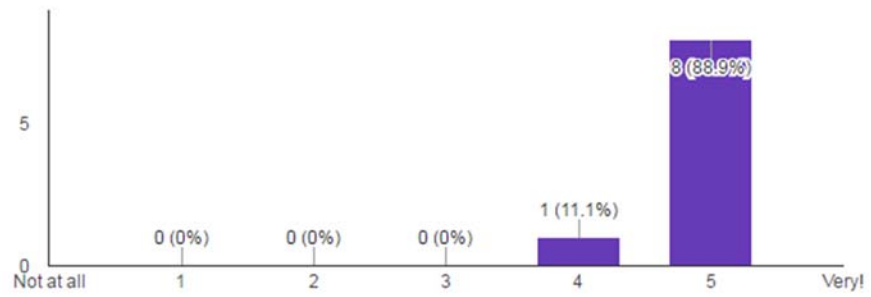
for the course from previous participants, Commander Dow and I found recruiting students for the ten-hour course to be difficult. In surveying our alpha testers, their greatest concern for the course was the time commitment involved; several stated that they would need significant incentives to attend (such as the networking opportunities, company-paid tuition, and/or excused time off from work).

The limited timeframe of the project prohibited actual deployment of the entire program in a real-world setting. Instead, I relied on the input of several key alpha testers - most notably, a Franklin-Covey® certified trainer who had received a walkthrough of the project's components. All other alpha testers were adult learners who had no previous training of a similar nature, but who were interested in developing their leadership skills. They agreed that the topics covered in all three sessions were valuable and appropriate, and that an hour per session was a sufficient length for the depth of discussion covered. The alpha testers were impressed with their walkthroughs of the Artemis Bridge Simulator, and expressed a desire to actually take one of the courses once the program was fully operational.

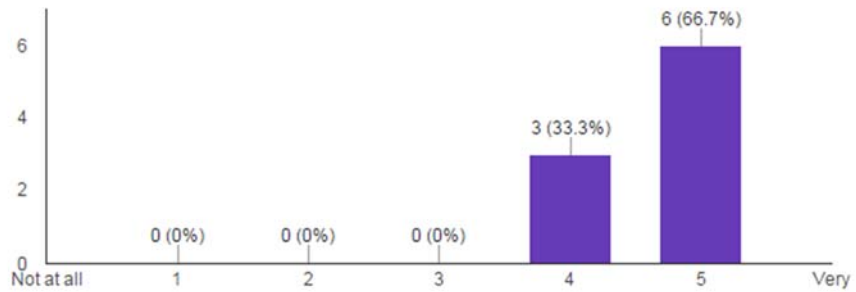
Beta Course and Feedback

My colleague and I beta-tested the Team Leadership course on a Saturday in April 2016. We personally recruited leadership-minded friends and acquaintances, and provided the full course of instruction for Team Leadership for free to solicit feedback for improvement. The compressed timeframe (six hours instead of ten) allowed us to experiment with offering the course in one-day seminar. My colleague provided the majority of the course instruction and discussion facilitation, while I focused on logistics, timing, simulator management, and other support activities. Our anonymous course evaluation feedback (from nine of the eleven students) indicated that the course was successful:

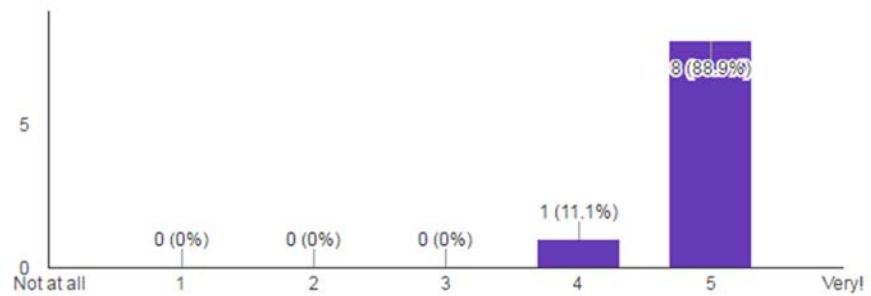
Was this course interesting? (9 responses)



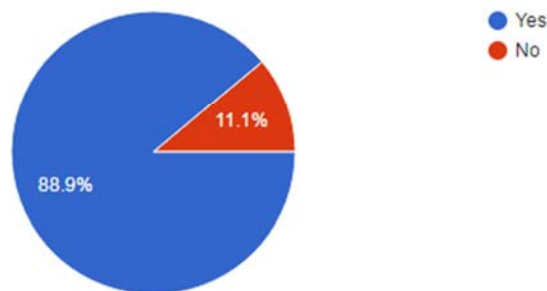
Were the course topics useful to you? (9 responses)



Was the room adequate? (9 responses)



Would you recommend the course to others? (9 responses)



Additionally, we obtained invaluable feedback from students on ways to improve the Team Leadership course (as well as the Self and Org Leadership courses) before the next class:

How can we improve the delivery? (7 responses)

Good stories, they seemed to be a lot during the end. Maybe I was just anticipating Artemis too much by then.

I think it would be useful to incorporate a more involved activity at the beginning of the course, not necessarily Artemis, but something that requires people to work as a group and struggle through some of the storming/forming phases would show a need for understanding leadership principles before diving into the content.

I would recommend spacing out Artemis and the other coursework.

Great stories. Allow participants to share their stories and to help them tie them back to the skills talked about. Military stories are great, more civilian stories would be good as well.

I have a feeling this was well within your plan, but further interaction between the presenters. I appreciated the real world applications/stories that connect the lesson beyond the classroom. Many, many, many thanks for your hard work and effort developing this engaging and entertaining leadership training. All the best to your success!

Going more in depth on each of the topics would be better realizing this was an abbreviated version. Artemis was a good capstone but being sure to really tie it back in and apply to real-life.

A big gap I see between our organizations "followers" vs "leaders" is the ability to be comfortable with the unknown. Artemis is an excellent simulator for learning to be more comfortable with the unknown and lead people through it. Great leaders do not have all the information, but rather they are comfortable leveraging the right people to make the best decision. If you are looking to develop new leaders, this is a great class!

Tellingly, at the end of both of the simulation sessions, the students were usually surprised that 40 minutes had elapsed. Their loss of a sense of time indicated that they were fully engaged in the simulation. No student suggested that the simulation was unnecessary or unhelpful; indeed,

several comments during the debrief phase indicated that the starship simulation provided the students with valuable insights into their own leadership biases and preferences.

We conducted our final simulator Alpha test on April 18, 2016 with six senior-level cadets in the University of Northern Iowa Army Reserve Officer Training Course (UNI-ROTC) program. We enabled four bridge stations, plus the Captain's chair, to gauge how the simulation program would be received by military officer trainees. At the end of the 40-minute session, the six cadets were visibly disappointed that the scenario had ended; we then had an excellent 15-minute discussion on Army leadership principles, and teamwork and coordination, and how the cadets demonstrated positive leadership traits and skills during the exercise. All cadets agreed when one mentioned that the simulation experience would make an excellent team-building replacement for a typical obstacle course experience that the cadets regularly undergo. An active duty Army officer/instructor, Major Matthew Perrino, USA, was on-hand to observe and report back to the ROTC command regarding our program's value. He expressed strong enthusiasm for the simulator experience, and provided several Army leadership manuals and documents to aid our leadership development efforts.

Conclusions and Recommendations

Value of a Simulator

Our April 2016 beta test (with eleven students) indicated that the starship bridge simulation is a valuable component of the leadership training experience. The immersion, fantasy, challenge, and control provided the students with ample opportunity to explore the leadership theories we discussed in the classroom. We believe this to be the most important finding of this project – that my colleague and I should continue investigating ways to integrate the Artemis Starship Bridge Simulator more fully into our leadership program.

Instructional Design Insights

The UbD framework was invaluable in planning and preparing my courses. The template provided an ideal check on my intended instruction, reminding me that any topic or discussion point needed to tie in to the overall understandings I wished the participants to earn. I also found that splitting the whole program into three separate courses – each with their own UbD template – allowed me to compartmentalize the learnings and make the entire planning process more manageable. I highly recommend this approach for similar complex courses of instruction, because the framework allows for strong focus on the development of the content itself, without the added burden of structural development.

Voice Communications and Recording

From a technical perspective, I determined that the lack of inter-ship voice communications is the most limiting aspect of our bridge simulation experience. We had to rely on a separate laptop running Zoom video-conferencing software to all allow the captains to coordinate their activities, because the built-in ‘communication messages’ simply aren’t detailed enough to enable effective fleet coordination during the Organizational Leadership simulation experience. Interaction, dialogue and collaborative learning are key components of enduring understandings (Wiggins & McTighe, 2005). Without the ability to immersively transmit new information to the starship captains, the immersive aspect of the simulation is hindered. Zoom also offers recording functionality, so a session could easily be recorded for playback and analysis. With appropriate time, snippets could be used in the debriefing to highlight specific leadership interactions and lessons, as was the case with our shipboard simulator at the Coast Guard Academy. Such playback would be much more memorable than simply reciting back what a participant did or said during the simulation, and is worth further investigation.

Strategic Components for the Organizational Leadership Course

Currently, Artemis Bridge Simulator lacks a true, built-in strategic component. The emphasis is on tactical mission execution (i.e. 'defend this convoy' or 'patrol this sector of space'). No larger consideration is provided as to *why* the convoy must be defended or a sector protected. The context of a grand strategy, overarching objectives, or long-term goals is missing within the simulation itself, and my own addition of strategies could be viewed by participants artificial and forced. In my Coast Guard simulations, the strategic component was modelled through a 'command center' which was distinct from the assets (ships and aircraft) which carried out the tactical missions. This simulated command center determined which missions were a priority, which assets would be devoted to mission execution, and why – and as a cadet, I quickly learned that this strategic component required a higher order of skill and wisdom than simple 'tactical thinking' allowed. This memorable introduction to strategic thinking was formative in the minds of all cadets who participated. For the Organizational Leadership course to meet its potential, the Artemis Starship Bridge Simulator will need a higher level of control for strategic planning to match its excellent tactical controls. I believe strongly in Artemis's potential to allow for similar strategic experiences, and will continue to refine these opportunities for development in the *Make It So* program.

Adaptive Enemy Simulation

While the Artemis Bridge Simulator allows the simulation director to program overall mission objectives and enemy artificial intelligence (AI) parameters, the simulation director or trusted delegate cannot actually control individual enemy ships, fire their weapons, or communicate to the participant's ships. In my Coast Guard simulation experiences, the simulation director provided voices and direct control over all the non-participant ships, which

added realism and adaptability to the simulation (with the enemy thoughtfully changing action to match participant strategy and tactics). This adaptive approach is critical for ensuring the simulations retain the optimal challenge level for effective participant engagement (Lopes, 2011). Too challenging, and the simulation will risk frustrating the participants during their growth experience; too easy, and the simulation will lack the sense of pressure needed to engage the learner. In both cases, the net result is a loss of interest. I noted this during my early demonstration of the Artemis Bridge Simulator at the University of Northern Iowa in March, 2015; attendees ranging from eight years old to 40+ years old had the chance to take the controls of Artemis; on the settings of easiest and hardest difficulty, play sessions lasted only a few minutes before the attendees moved on to the next booth. But I discovered that some attendees became more drawn in at the 'mid-range' setting, for much longer sessions (up to an hour). This anecdotal evidence is worth further research, to determine causality and explore possibilities for 'difficulty presets' based on a variety of factors (previous gaming experience, comfort with technology, and other motivational factors).

Combining Courses into a Single Large Exercise

Each course (*Self Leadership*, *Team Leadership*, and *Organizational Leadership*) leads to a culmination exercise in the Artemis Bridge Simulator, with each simulation experience adding a level of complexity (individual performance, to team performance, to organizational performance). A single, comprehensive simulation would be an intriguing capstone for this program; the *Organizational Leadership* course participant would prepare strategies and issue fleet commands while the *Team Leadership* students practice their captaining skills, and the *Self Leadership* students carry out their orders. This kind of comprehensive simulation experience would require greater facilitation and oversight (multiple coaches and evaluators) but would be a

very authentic approach to leadership simulation. Such a simulation would require an additional level of coding by the Artemis Bridge Simulator programmer, namely a Fleet Command station with:

- An overall strategic map, showing the transponder data from all allied ships, and known data from enemy and neutral ships;
- Forecasts for 'space weather' phenomena and other simulation-affecting variables;
- Communications channels for contacting each ship with new orders as needed.

This software upgrade would provide a new and engaging dynamic to the multiplayer cooperation experience - one providing an 'Admiral's level' view of the battlespace, in order to coordinate the actions of the individual ships. This experience would be an excellent means for impressing on participants the difference between strategic and tactical actions, and why some decisions must be left in the hands of the people best equipped and positioned to ensure their success. As a result of their efforts, they would be well positioned to earn the enduring understandings necessary for success in the course (Wiggins & McTighe, 2005).

Future Directions for the Program

As my colleague and I strategize how to best offer this unique program in the Cedar Valley, we are heartened to know that similar competing courses do not currently exist; this level of affordable leadership training for the mass-market has not yet been established regionally. For this reason, the *Make It So* leadership course is a disruptive innovation, giving the market a new product which, lacking some of the finesse and complexity of other major simulator experiences, still provides an experience where no suitable alternative exists (Christensen, Horn, & Johnson, 2008). Following this guidance, our goal will be to continue positioning the *Self Leadership*, *Team Leadership*, and *Organizational Leadership* courses as a novel continuing education

opportunity at the community college level, as well as offering the independent modules (such as followership, team communication, and strategic planning) to corporations and non-profits as one-day professional development sessions, along with a short demonstration (live or video) of the simulation experience. Such an approach will allow us to garner the kind of testimonials and enthusiasm needed to regularly offer the full course (including the simulator experience) in the Cedar Valley, so that participants can transfer the knowledge, skills and their understanding to variety of contexts.

Overall, the experiences and feedback obtained in the development of the *Make It So* project give me confidence that this program of instruction is a novel and valuable addition to the Cedar Valley's local leadership training catalog. The *Make It So* program has the potential to be a model program for this discipline in the Cedar Valley, and particularly at the University of Northern Iowa and Hawkeye Community College. When describing the course to colleagues and potential students, their enthusiasm for this novel approach to leadership training is evident, and adds to my confidence in the value of continued development. I will eagerly be working to realize the potential of Artemis's capabilities as leadership training experience in the years to come.

While this program is primarily intended for delivery at a continuing education/adult learner level, more research is needed to determine the appropriateness of the classroom and simulator experience for a variety of demographics. During my alpha testing, I enlisted my own children (age 9 and 7) and their friends to help me acclimate to the starship's various bridge stations and mission scenarios. I was shocked to see how quickly they picked up the controls and their eagerness to work as a team to complete the built-in missions. I used those sessions (totaling about six hours) to coach them on leadership and teamwork, and observed marked

improvement in their team and leadership skills during that timeframe. This indicates a strong potential for adapting this course to teach significant leadership concepts to the primary and secondary school demographic, and is worth pursuing. Along those lines, more research is needed to determine if the course is appropriate for technology-averse adult learners. I plan to conduct an action research project while I implement the program to investigate the following questions: Would the starship bridge simulation technology be an impedance to the leadership training for technology averse learners? Would they still find value in the simulation experience? If not, what alternative means can we use to deliver the same experiential learning experience?

Given the enthusiasm and support from our April 2016 alpha test with the UNI-ROTC Army officer trainees, Commander Dow and I will also seek to adapt our program to meet training objectives for regional Army, Navy, and Air Force ROTC and Junior ROTC programs. Because our own background is military, Commander Dow and I are much at ease with presenting this course material to military officers, and the novel experience may be a formative memory in their careers - a teamwork and leadership experience to reflect on fondly. The program will also benefit from ROTC participation, as we will no doubt gain additional insights on leadership from observing the cadets and midshipmen as they command and crew ARTEMIS and her sister ships.

This program of instruction can be viewed as a disruptive technology, serving a need not currently met by existing sources (Christensen et al., 2008). From this perspective, *Make It So* is very well poised to take advantage of nascent technologies, including virtual and augmented reality displays, inexpensive touch screen and projection devices (for creating a physical bridge), and even virtual goggle projection to render remotely-linked players in the same ‘virtual bridge’. Additionally, the success of Artemis Starship Bridge Simulator has led to new, more advanced

simulator projects which actually contain the strategic flavor currently missing from Artemis. As was readily learned through the UbD framework, the *learnings* are the most critical attribute of the course. I am not wedded to Artemis Starship Bridge Simulator; it simply compliments the instruction, and so I must retain the flexibility to change the simulation experience as needed to ensure that this program of instruction is as valuable as possible to the community it will serve.

That said, the project is absolutely a work in progress. I need to refine the course slides, improve the scenarios, investigate other simulator software, and continually re-visit the UbD framework to ensure the program actually meets its potential, using solid pedagogy and sound design principles. Fortunately, the effort itself is a labor of love, and I continually see new methods and examples to incorporate into the courses. I only need to see the delight of my own children and their friends as they work out their own leadership and teamwork styles on Artemis's bridge; I believe we have captured 'lightning in a bottle' with this program, and need only time, enthusiasm, and experience to develop this project into a national-level model of leadership training excellence. The groundwork for an excellent program was laid through this research project – the next step is to conduct prototype classes which will 'Make it so!'

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